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Web services provide a standard means of communication among distributed software applications based on the Web technology. Standardization by the W3C community.

- Motivation - Example
- Service Oriented Architecture - SOA
- Web Services - Characteristics
- Web Services Architecture
- Simple Object Access Protocol (SOAP)
- Web Services Description Language (WSDL)
- Universal Description, Discovery, and Integration (UDDI)
- REST
- Web Service Composition
- Adopting Web Services
- Mashups

Simple Object Access Protocol (SOAP)

SOAP is a de-facto standard for XML messaging:

- relatively simple,
- flexible and extensible,
- based on XML,
- not bound to a specific protocol, use of Internet protocols such as HTTP, SMTP
- may be used for RPC or document transfer.

SOAP consists of three parts:
- an envelope,
- a set of encoding rules,
- a convention for representing remote procedure calls and responses.

SOAP Message

Parts of SOAP
- Exchange Model
- Using SOAP in HTTP
- SOAP RPC Conventions
- Minimalist Infrastructure for Web Services
A SOAP application receiving a SOAP message must process the message by performing the following actions:

1. Identify all parts of the SOAP message intended for that application; interpret the "SOAP actor" attribute of the SOAP header.
2. Verify that all mandatory parts are supported by the application for this message and process them accordingly.
3. If the SOAP application is not the ultimate destination of the message then remove all parts identified in step 1 before forwarding the message.

POST /StockQuote HTTP/1.1
Host: www.stockquoteserver.com
Content-Type: text/xml; charset="utf-8"
Content-Length: 88
SOAPAction: "Some-URI"

<SOAP-ENV:Envelope
   xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/"
   SOAP-ENV:encodingStyle="http://schemas.xmlsoap.org/soap/encoding/"
   >
   <SOAP-ENV:Body>
   <m:GetLastTradePrice xmlns:m="Some-URI">
   <symbol>DIS</symbol>
   </m:GetLastTradePrice>
   </SOAP-ENV:Body>
</SOAP-ENV:Envelope>

HTTP/1.1 200 OK
Content-Type: text/xml; charset="utf-8"
Content-Length: 124

<SOAP-ENV:Envelope
   xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/"
   SOAP-ENV:encodingStyle="http://schemas.xmlsoap.org/soap/encoding/"
   >
   <SOAP-ENV:Body>
   <m:GetLastTradePriceResponse xmlns:m="Some-URI">
   <Price>33.2</Price>
   </m:GetLastTradePriceResponse>
   </SOAP-ENV:Body>
</SOAP-ENV:Envelope>

SOAP request: processed by a servlet, CGI or standalone daemon running on a remote web server.
RPC interactions may be mapped to SOAP:

```xml
.SOAP based middleware
network
.SOAP based middleware

Example
```

Java Method

```java
public int addFive(int arg):

Request Message in SOAP
```
Routing is a process of delivering messages through a series of nodes or intermediaries, called SOAP Routers in the context of SOAP.

The SOAP Router is the entity that moves SOAP messages between internal and external networks.

Besides routing capabilities the SOAP Router may provide value-added services such as logging, auditing and enforcement of security policies.

WS-Routing is a protocol that defines how SOAP messages can be delivered using various transports.

Ian Forster states: “Web service have little value if others cannot discover, access, and make sense of them.”

Definition: A WSDL document defines services as collections of network endpoints, or ports. WSDL has a purpose similar to that of IDLs in conventional middleware platforms. A WSDL description describes 3 fundamental properties of a Web Service:

What a service does; operations and the arguments needed to invoke them.

How a service is accessed: details of data formats and protocols.

Where a service is located: details of the protocol-specific network address, such as a URI.

A WSDL document uses the following elements in the definition of network services:

Types: a container for non-built-in data type definitions using some type system, e.g., arrays and structures.

Message: an abstract, typed definition of the data being transferred between the requestor and service;

method call (request/response): modeled as 2 messages.

Port Type: an abstract set of operations supported by one or more endpoints; an operation specifies a specific input/output message sequence.

Operation: an abstract description of an action supported by the service.

Binding: specifies a concrete protocol and data format for the operations and messages defined by a particular PortType, such as SOAP or Corba.

Port: a single endpoint defined as a combination of a binding and a network address.


Parts of WSDL

Relationship of parts